

REMARKS

Claims 1-19 are pending in the application. Claims 1-13 and 17-19 are withdrawn from consideration as non-elected. Claims 14 and 15 have been amended in order to secure their allowability. Claims 1-13 and 17-19 have been canceled in order to permit this application to be allowed as soon as possible. Cancellation is without prejudice or disclaimer and Applicant does not waive any right to file one or more divisional applications under 35 U.S.C. § 121.

Claim Rejections - 35 U.S.C. § 102

Claims 14-16 are rejected under 35 U.S.C. § 102(e) as being anticipated by Takahashi et al (6,306,211). This rejection is traversed for at least the following reasons.

In Takahashi et al, Figure 4 shows a dopant concentration profile for an n-type doped layer 23, a non-doped layer 22, and a substrate 3, as explicitly described in column 8, lines 49 to 50. Further, Fig. 4 shows a nitrogen concentration gradient in a transition region between the non-doped and n-type doped layers is $7 \times 10^{18} \text{ atoms/cm}^3 / 0.03 \mu\text{m} = 2.3 \times 10^{17} \text{ atoms cm}^{-3}/\text{nm}$ (column 9, lines 5 to 9) that is equal to $2.3 \times 10^{24} \text{ cm}^{-4}$.

The Examiner is respectfully requested to note that the foregoing description in Takahashi et al is not directed to a concentration gradient of a pn junction composed of different types of semiconductors, namely, different doped areas. In other words, Takahashi et al has no disclosure of a method of manufacturing different types of doped areas in a SiC layer.

Moreover, in Takahashi et al, a non-doped layer 22 of 6HSiC single crystals is grown epitaxially on a principal surface (i.e., an off-axis (0001) lane) of a substrate 3 (column 8, lines 18 to 20). Subsequently, nitrogen gas is supplied as a doping gas into a chamber 1 to form an n-type doped layer 23 on the non-doped layers 22, as shown in Fig. 2 (c) (column 8, lines 21 to 25). From this fact, it is readily understood in Takahashi et al that a silicon carbide nondoped layer 22 is previously prepared prior to formation of the doped layer 23. In this connection, this method may be called a “pre-carbonization” method because the silicon carbide layer is prepared beforehand.

By contrast, according to the present invention, a silicon carbide has a pn junction that is composed of different conductive types of semiconductors (page 25, lines 11 to 25 and page 27,

lines 13 to 20 of the specification) and the pn junction has an impurity concentration gradient between $1 \times 10^{22}/\text{cm}^4$ and $4 \times 10^{24}/\text{cm}^4$ in the thickness direction. Such a pn junction is obtained by a method of doping a silicon layer with an impurity and, thereafter, carbonizing the doped silicon layer into a silicon carbide layer doped with the impurity. This method may be called a "post carbonization" method because the carbonization step is carried out after the impurity doping step.

Clearly, the post carbonization method differs substantively from a pre carbonization method as utilized in Takahashi et al. The silicon carbide manufactured by the post carbonization method enables a preferential formation of the pn junction in the silicon carbide. Specifically, the method according to the present invention is helpful to selectively form different conductive types of the silicon carbide.

Since there is no teaching at all in Takahashi et al as to forming a pn junction or the post carbonization method, Applicant respectfully submits that the present invention is not obvious from Takahashi et al. Moreover, since the post carbonization method is substantively different from the pre carbonization method in timing and effect, one of ordinary skill would not be motivated to modify Takahashi et al to utilize a post carbonization method. In order to define this feature more clearly in the claims, Applicant has amended claims 14 and 15. Clearly, the subject matter defined therein is not seen in any of the prior art cited by the Examiner.

Finally, Applicant wishes to note that the text of claim 14 that appears in the amendment filed on August 1, 2003 omitted certain words in line 7, namely "doped silicon layer; and." These words appeared in the claim as presented in the amendment filed on November 18, 2002 but were inadvertently omitted when reproducing the claim as a "previously presented" claim in the amendment of August 1, 2003. Applicant submits that there is no substantive effect from such omission and Applicant apologizes for any inconvenience to the Examiner.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Amendment under 37 C.F.R. § 1.111
Application No. 09/924,872

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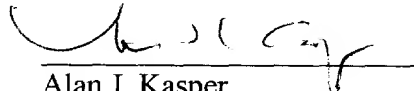
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